THE INSTITUTE SPOKESMAN

PUBLISHED BY THE
NATIONAL LUBRICATING GREASE INSTITUTE

VOLUME X • NUMBER 12 • MARCH 1947

"The First Ten, With Four Score Yet to Go"

This issue of "The Institute Spokesman" marks the end of the first decade in its existence. With the publication of this issue we round out the first ten years of this publication that has served the lubricating grease manufacturing industry and the consuming public.

Looking back over those ten years there have been a great many changes in the industry, there have been changes in the personnel, even as there has been changes in "The Spokesman" itself.

Four years after the founding of the National Lubricating Grease Institute in 1933, by Mr. Wm. H. Saunders, Jr., International Lubricant Corp., New Orleans, Louisiana; Mr. Guy Peters, Oil-Kraft, Cincinnati, Ohio, and Mr. J. R. Battenfeld, Battenfeld Grease and Oil Company, Kansas City, Missouri, who became the Institute's first president, it was felt that there should be some means of sending out information concerning the production, testing, and use of lubricating greases. This publication should appear at regular intervals and should be the responsibility of the National Lubricating Grease Institute.

The executive committee of N. L. G. I., meeting in the Downtown Athletic Club in New York City early in 1937 decided that a monthly paper should be published. Mr. Homer Wilhelm, president of N. L. G. I. at that time, suggested the name of "The Institute Spokesman", which was adopted. Starting with the March 1937 issue, it has been published monthly ever since.

Originally there were four pages of mimeographed material with a circulation of two hundred. After the first year, starting with the April 1938 issue, it was changed from a mimeographed to a printed publication and because it contained papers of technical nature and items of interest to the industry it was already begining to claim its rightful place of importance. The circulation jumped from two hundred to six hundred copies per month.

Advertisers were attracted to "The Spokesman". They recognized it as a good media for their sales message and requested permission to submit their copy. The first ad appeared in the February 1939 issue. They totaled two thirds of a page, which was a good start, but greatly in contrast with the total amount of advertising carried in this tenth anniversary number.

With the April 1941 issue the size was increased to eight pages in response to the combined desire and demand that more and more technical information of value to the industry be carried in its columns. It also provided for the sales message for the advertisers who were requesting the privilege of using its columns.

In November 1946 the size was again increased to twelve pages and then only three months later the February issue hit an all-time high of sixteen pages, four times larger than the original issue just ten years previous.

The format of "The Institute Spokesman" has been changed only once in this ten-year span of its existence. The blue masthead became a familiar sight on the desk of executives, chemists, and technologists of the industry and the libraries that served them.

With the November issue 1946 there was a complete change in the format. The color was changed from blue to green. The printed matter was taken off of the front page. A new cover was designed with a circular picture having some direct reference to the lubricating grease manufacturing industry. Inside the solid pages of advertising were broken up. Printed matter was placed on every page. New features of general interest to the industry were added and there has been a liberal use of pictures to help carry the story told by the printed word. The whole effect has been to make the publication more readable and create greater reader interest.

The January 1947 issue carries a complete index alphabetized by the authors' names of all of the technical articles that have appeared in "The Institute Spokesman" from its inception in March 1937, up to and including March 1946. This issue carries a similar index covering the issues from April 1946, to and including March 1947. Each year from now on the March issue will carry an index of the

Continued on page 22

The INSTITUTE SPOKESMAN

Published monthly by
THE NATIONAL LUBRICATING GREASE INSTITUTE

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Kansas City 2, Mo.

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President's Column . . .

H. P. Hobart Pres. N. L. G. I.

With the enlarged circulation of "The Institute Spokesman," this 13th Anniversary issue offers an ideal opportunity to present to the Institute's new members, to the grease industry in general, and to consumers of grease in both the automotive and industrial fields, a brief history of the foundation and growth of this Institute, an outline of its aims and purposes and some idea of its future plans.

As late as 1933 the manufacturers of lubricating grease throughout this country had no organization of their own through which they could be appropriately articulate in such matters as N. R. A., Federal Excise Tax Act of 1932, grease classifications, and many other matters affecting the use and manufacture of lubricating grease. During that year, however, a group composed largely of independent grease manufacturers founded the National Association of Lubricating Grease Manufacturers, Inc., filing incorporation papers on September 27, 1933, under the laws of the State of Ohio. This Association was set up "to act as a clearing house for the manufacturers and the trade in the collection and dissemination of lawful information pertinent to the industries of lubricating grease manufacture, oil compounding, and allied industries."

Working with the Government Officials of N. R. A., they brought about a separate code for the lubricating grease industry.

About 1937 the name was changed to the National Lubricating Grease Institute, and publication of "The Institute Spokesman" was started.

Membership in the Institute has grown consistently and today the active members represent approximately 95% of the grease manufacturing capacity of the country.

In addition, the Institute has a rapidly increasing group of Associate Members representing well-known firms engaged in the manufacture of grease dispensing equipment or other endeavors allied to grease manufacture.

The affairs of the Institute are managed by a Board of 18 Directors elected

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Technical Committee Conducts Cooperative Program

Under the sponsorship and direction of the National Lubricating Grease Institute's Technical Committee a symposium on the "Pumpability of Grease and Delivery Characteristics of Dispensing Equipment" was held on the third day of the Fourteenth Annual N. L. G. I. Convention in Chicago, Illinois, on Wednesday, October the second, 1946.

Well planned, under the capable direction of Mr. H. L. Moir of the Pure Oil Company, Chicago, chairman of the Technical Committee, invitations had been extended to the leading grease technologists and the outstanding dispensing equipment engineers to be present at this meeting with prepared statements on this very important and timely subject.

When Chairman Moir called the symposium to order, the Grand Ballroom of Edgewater Beach Hotel was well filled with representatives of both industries; the lubricating grease manufacturers and the dispensing equipment manufacturers. The discussion was well prepared and most speakers used drawings and illustrations to supplement the spoken word. When

Continued on page 7

Well Done . . .

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THE EFFECT OF SOAP STRUCTURES ON *Apparent Viscosities* OF LUBRICATING GREASES

by T. G. ROEHNER and R. C. ROBINSON, *Socony-Vacuum Laboratories*

About the Author

Mr. T. G. Roehner was born in Brooklyn, New York, in 1900. He received his Bachelor of Chemistry Degree from Cornell University in 1924. For six years immediately following graduation, Mr. Roehner worked in Rancagua, Chile, South America, with the Braden Copper Company, a subsidiary of Kennecott Copper Company. His starting position was that of chemist, from which he rapidly advanced to a test engineer and finally Chief Chemist. In 1930 the author started with the Standard Oil Company of Brooklyn, New York, as a chemist and became supervisor of Product Development. His present position is that of Technical Director of the Technical Service Laboratory, Socony Vacuum Oil Company, Inc., at 412 Green Point Avenue, Brooklyn, 22, N.Y. Mr. Roehner speaks with the authority of a background of sixteen years experience with grease problems from all angles — analytical, formulation, laboratory evaluation,, manufacturing and servicing under actual service conditions.

T. G. Roehner, Technical Director, Technical Service Laboratories, Socony-Vacuum Oil Co., Inc., as he used the pointer and blackboard to illustrate some points during the discussion that followed the delivery of this paper before the 14th Annual Convention in Chicago, September 30th, 1946.

EDITOR'S NOTE:
The opinions expressed in the following article are those of the author. "The Spokesman" takes no credit and assumes no liability therefor.

The development of the SOD Pressure Viscosimeter and of procedures for the determination of the apparent viscosities of lubricating greases at a range of rates of shear and temperatures has led to a better understanding of the part which the soap component of greases plays in deciding their flow characteristics under service conditions. Apparent viscosities have been shown by M. H. Arveson[1] and by J. C. Zimmer and J. B. Patberg[2] to reflect the resistance of the soap structures of greases to deformation. A further study of the effect of variations of concentration of typical soaps on apparent viscosities may therefore be of immediate interest.

[1] M. H. Arveson, Ind. Eng. Chem., Vol. 24, Jan., 1932, and Vol. 26, June, 1934.
[2] J. C. Zimmer and J. B. Patberg, "The Institute Spokesman", Vol. IX, Nos. 4 and 5, July-Aug., 1945.

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In the series of tests described hereinafter, four types of soap bases are compared, i. e., lithium, aluminum, calcium and sodium. It is well known that their structures are dependent on a number of factors, including concentration, temperature, procedure of manufacture, additives, and on the chemical composition of the mineral oil in which they are dispersed. Because of the importance of the mineral oil component, the four types were used with at least two mineral oils. The concentrations of the soaps in the greases were varied over the range commonly found in commercial lubricants, and the determinations of their apparent viscosities were run at 30°, 77°, 130° and 210° F. Testing over this spread was facilitated by using Modification Three of the SOD Pressure Visco imeter, which is described and illustrated in the report entitled "Determination of the Flow Characteristics of Lubricating Greases," issued jointly by the Coordinating Lubricants Research Committee of the Coordinating Research Council and the Technical Committee of the National Lubricating Grease Institute. The pressure limits of Modification Three are the same as those of the original apparatus and the rates of shear employed therefore were held within 25 and 10,000 reciprocal seconds.

The characteristics of the greases tested in this series are summarized in Table I. The results of the determination of apparent viscosities are summarized by plotting on two kinds of log curves, i. e., apparent viscosity vs. rate of shear at a given temperature and apparent viscosity vs. temperature at a given rate of shear.

It will be noted on inspection of the curves for lithium greases that

1—Except at temperatures as low as 30° F., the apparent viscosities-shear rate relationships shown on Figures 1-4 show little effect resultant from a variation in S. U. viscosities of mineral oils from 55" to 840" at 100° F. and from an increase in soap content from 10% to 20%. At 130° F. and 210° F. the samples containing 10% of soap have the lowe t apparent viscosities regardless of their widely different mineral oil components.

2—Refer.ing to Figures 15-20, where temperature rather than shear rate is taken as a parameter, the curves representing all three soap concentrations tend to converge at 210° F. At least some of the reason for the amount of spread at 30° F. becomes apparent on comparing below (Table II) the viscosities of the mineral oils throughout the test range with the corresponding apparent viscosities of the greases containing 15% lithium soap.

TABLE II

S. U. Viscosity of the Base Oils

	30° F	77° F	130° F	210° F
300" Oil	5100	625	141	51
840" Oil	40000	2380	310	65

Apparent Viscosities in Poises at 25 sec. —1 Shear Rate

Lithium Grease using	30° F	77° F	130° F	210° F
300" Oil	1830	1210	819	455
840" Oil	2690	1220	750	425

3—The dominating part which the mineral oil component may have as compared to soap concentration is also illustrated by the data given in Figure 45 where the insertion of a lithium grease made with a 300" paraffin base oil between the two greases containing 55" and 840" base oils shows an overlap at low shear rates.

The curves for the series of lithium base greases are quite orderly as compared with the corresponding plots for the aluminum base greases. It is well known

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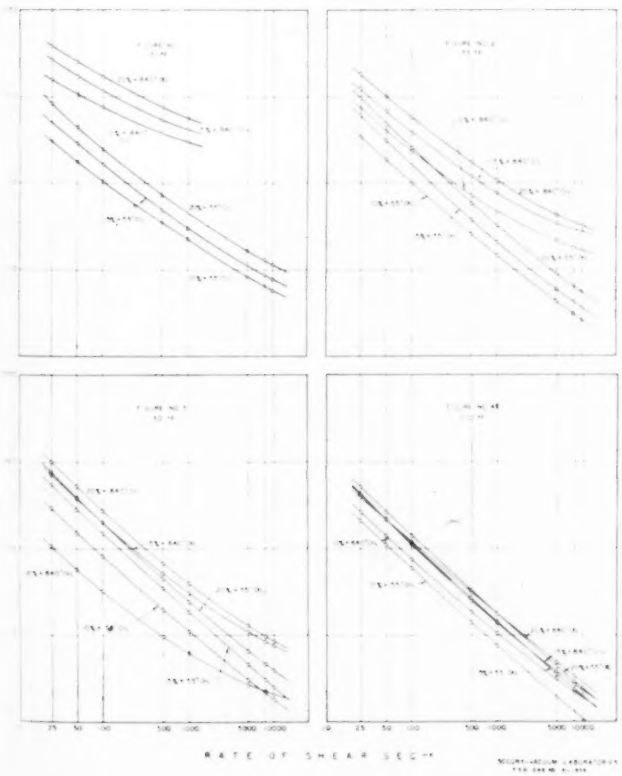
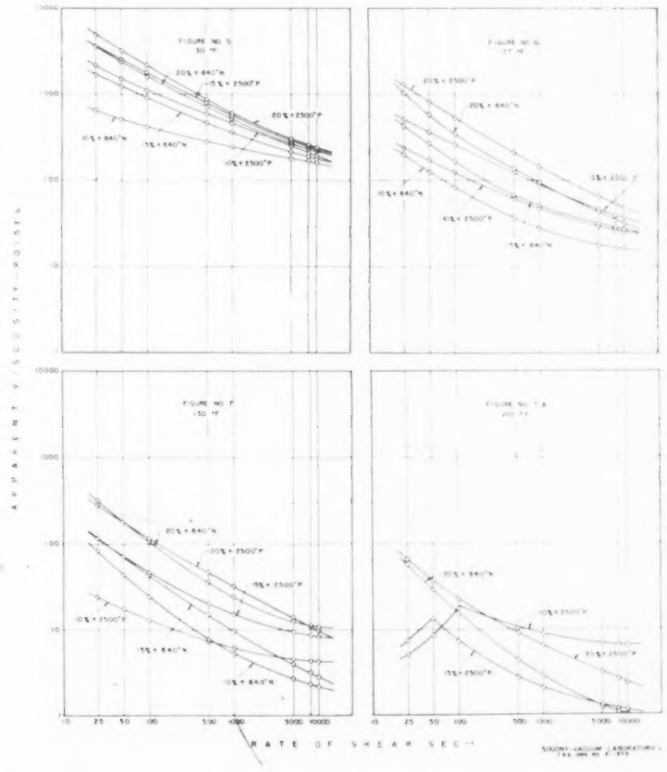
LITHIUM GREASES IN NAPHTHENIC BASE OILS



SODIUM GREASES IN NAPHTHENIC AND PARAFFINIC BASE OILS

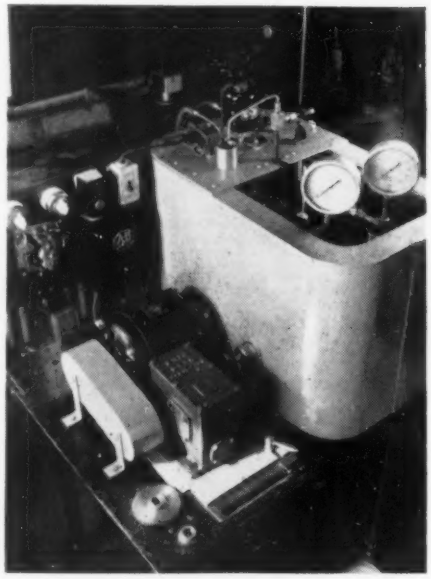


that aluminum stearate type cup greases are sensitive to changes in temperature and this eccentricity is reflected in criss-crossing of the curves. It is of interest to note that

1—The aluminum resembles the lithium base greases in that at 130° F. and 210° F. the lowest apparent viscosities are obtained with the lowest soap content even though the S. U. viscosities of their mineral oil components had a spread of 3160 seconds at 100° F. (Figures 8-11). As the temperature increased from 30° F. to 210° F. the sample with 7% of soap and 4000" oil showed less and less difference when compared with the corresponding grease made with an 840" oil.

2—Figures 27-32 also show erratic changes in apparent viscosities. The curves have one obvious similarity, i. e., a recovery of body or apparent viscosity as the temperature is raised. After this increase due to change in structure has reached its maximum, the greases behave in a normal manner and soften as further heat is applied.

The data summarized in Figures 5-7a show that the sodium greases having the lowest soap concentrations become relatively indifferent to viscosity of mineral



Modified SOD Pressure Viscometer

oil as the temperature is increased to 210° F. Furthermore, a definite reversal occurs at elevated temperatures. Previous experience has shown that this reversal is effected by the amount of working which the greases receive because at those temperature levels milling of the products encourages the formation of a comparatively tough fibred structure. This type of behavior is also indicated by the plots shown in Figures 21-26. Conventional commercial sodium base greases vary widely in structure. Photo-micrographs of a so-called sponge grease will disclose a coarse, long fibre, while a product made with a soap such as sodium stearate will have a comparatively short, fine fibre. The samples used in this series were medium fibred products.

A review of the data summarized in Figures 12-14 indicates that within the range of shear rates permitted by the aforementioned tester, the apparent viscosities of calcium base greases tend to be quite responsive to variations in soap content. For example, in Figure 14, the greases are paired in accordance with soap content rather than on the basis of viscosity of mineral oil. This trend is also apparent in the location of the curves given in Figures 33-38.

A comparison of all four types of soap base may be facilitated by presenting the series of curves in Figures 39-41, wherein the main variable is composition of the soap and the resultant soap structure. The fatty radicals of all of the soaps used in this series are not identical, but they are as similar as permitted by the requirement that the greases be stable, commercial grade products. The data indicate that the increase in apparent viscosity

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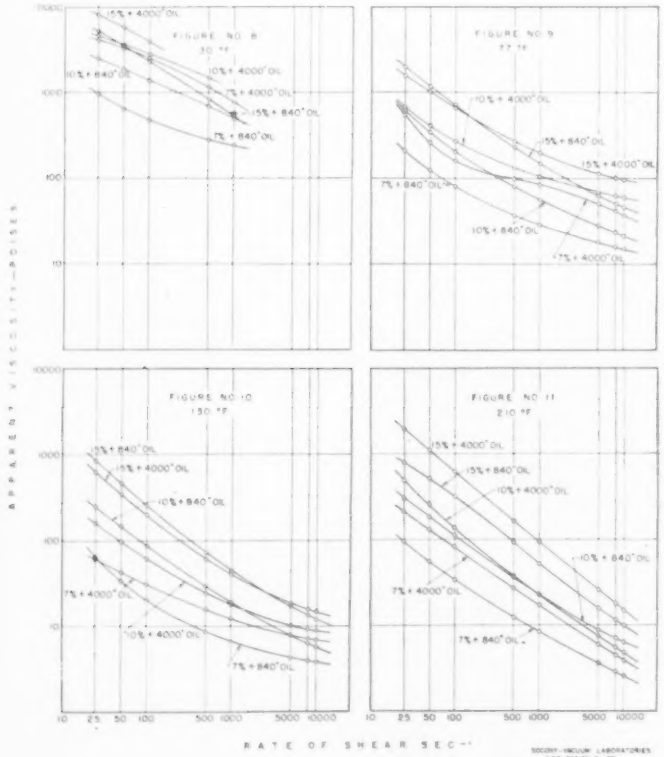
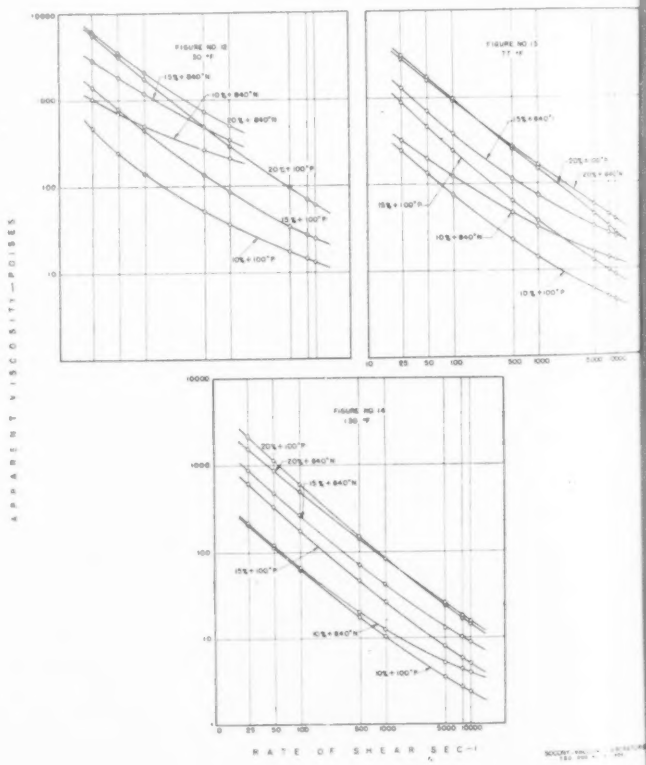
[3] T. G. Hoehner and R. C. Robinson, "The Institute Spokesman", Vol. IX, No. 2, May, 1945.

ALUMINUM GREASES IN NAPHTHENIC BASE OILS



CALCIUM GREASES IN NAPHTHENIC AND PARAFFINIC BASE OILS



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Technical Committee Conducts Cooperative Program

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the meeting was over everyone declared themselves as having spent a most profitable, informative day and in favor of the symposium method of approaching an important subject of this kind.

Recognizing the importance of the discussion that took place during this symposium, the Technical Committee secured, with the cooperation of the various speakers, written discussions of the data and information presented verbally at the meeting. Complete with drawings and illustrations used by each author the material has been duplicated and copies have been mailed to the members of the National Lubricating Grease Institute and to the N. L. G. I. Technical Committee as well as the grease dispensing equipment manufacturers.

Because of the great interest in this subject and the value of this discussion material additional copies have been prepared, bound in heavy paper deposition covers. They are available as long as the limited supply lasts at one dollar per copy. Your request should be directed to Mr. Carl E. Bolte, executive secretary, National Lubricating Grease Institute, 4638 Mill Creek Parkway, Kansas City 2, Missouri.

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The Effect of Soap Structures On Apparent Viscosities of Lubricating Greases

Continued from page 6

due to soap is most pronounced with aluminum base and least with sodium base. Beerbower, Sproule, Patberg and Zimmer[1] in their study of the effect of various soaps on apparent viscosity reported the same trend so far as aluminum, calcium and sodium bases are concerned. It is of interest to note that they also found that severe milling of a calcium base grease caused a reduction of apparent viscosity apparently due to some breakdown of the grease structure.

When widespread interest in apparent viscosities was revived due to activities of the Technical Committee of N. L. G. I., there was considerable discussion regarding the possible use of apparent viscosities as a means for obtaining apparent viscosity indices, which would serve the same purpose as viscosity indices for lubricating oils. The ideal grease in terms of consistency and apparent viscosity is that product which undergoes no change in those characteristics when employed under service conditions at a wide range of temperatures. Inspection of the apparent viscosity-shear rate curves reported to date have not disclosed such a product. It would require, among other conditions, a soap or combination of soaps that would change in structure only sufficiently to compensate for variations in the viscosity of the mineral oil. The curve given in Figure 42, wherein apparent viscosities are plotted against temperature, is representative of a lithium base grease of the so-called AN-G-3a type which reaches for the ideal to the extent that it has practically a plateau between 50° F. and 130° F. So far as more conventional greases are concerned, present available data indicate that their apparent viscosity-shear rate relationships may vary widely over the normal operating temperature range.

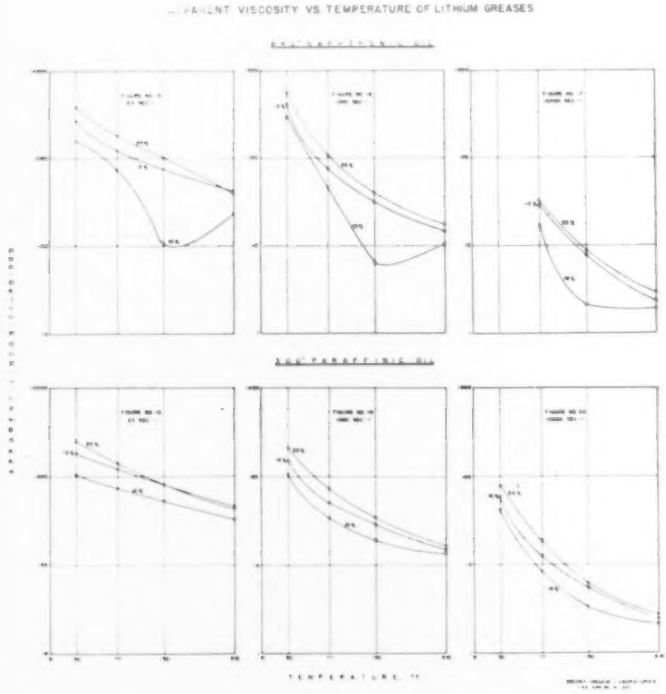
Finally, it may be concluded from the data obtained from the subject series of tests that normal increases in the concentration of soap in greases does not necessarily lead to increases in their apparent viscosities, because under certain conditions of shear rate and temperature, the characteristics of the mineral oil components may be the predominating factor.

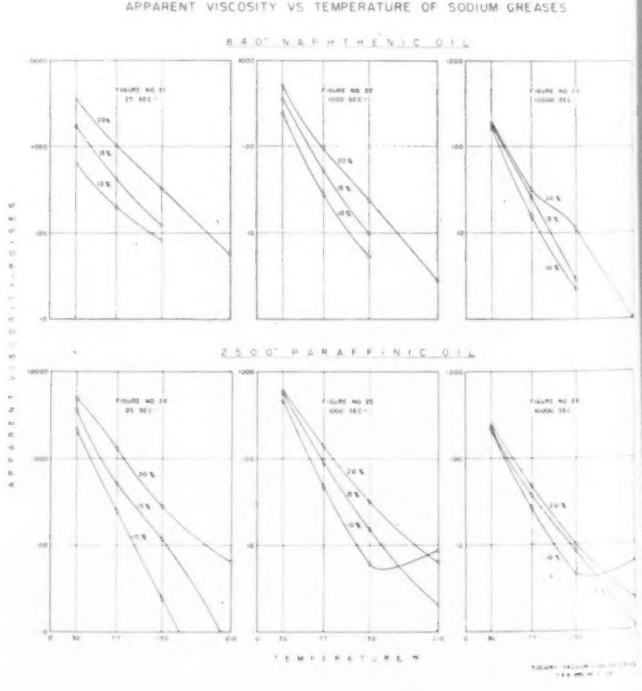
[1] A. Beerbower, L. W. Sproule, J. B. Patberg, J. C. Zimmer, "The Institute Spokesman", Vol. VI, Nos. 8-11, Nov., 1942-Feb., 1943.

TABLE I
CHARACTERISTICS OF EXPERIMENTAL GREASES

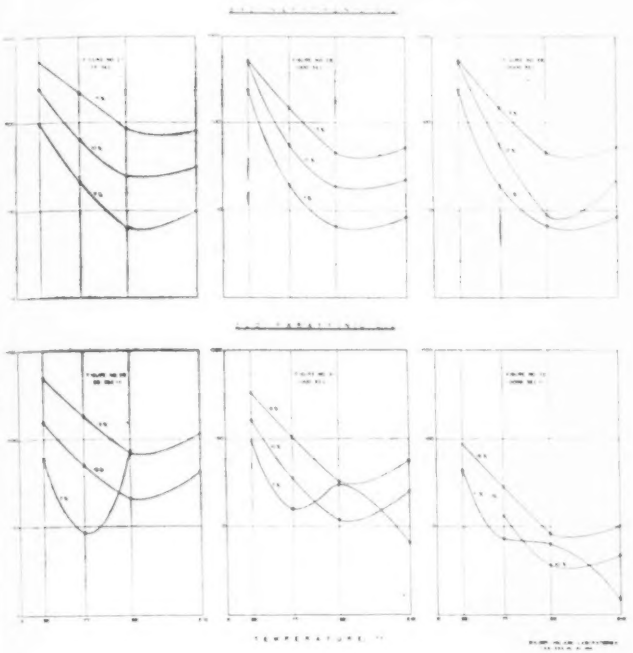
Type of Grease—	*Approximate Soap Content %	Water %	ASTM Penetration Unworked	Worked
Lithium Base Greases				
55" Oil	10.0	Trace	305	
	15.0	Trace	260	
	20.0	Trace	225	
500" Oil	10.0	Trace	255	
	15.0	Trace	235	
	20.0	Trace	205	
840" Oil	10.0	Trace	270	
	15.0	Trace	230	
	20.0	Trace	200	
Aluminum Base Greases				
500" Oil	7.0	Trace	320	
	10.0	Trace	245	
	15.0	Trace	175	
840" Oil	7.0	Trace	340	
	10.0	Trace	237	
	15.0	Trace	170	
4000" Oil	7.0	Trace	325	
	10.0	Trace	273	
	15.0	Trace	190	
Sodium Base Greases				
840" Oil	10.0	Trace	335	
	15.0	Trace	280	
	20.0	Trace	210	
2500" Oil	10.0	Trace	340	
	15.0	Trace	285	
	20.0	Trace	210	
Calcium Base Greases				
100" Oil	10.0	1.2	.....	
	15.0	2.0	.....	
	20.0	3.0	.....	
840" Oil	10.0	1.0	.....	
	15.0	2.0	.....	
	20.0	2.5	.....	

* Varied less than one per cent from given value.

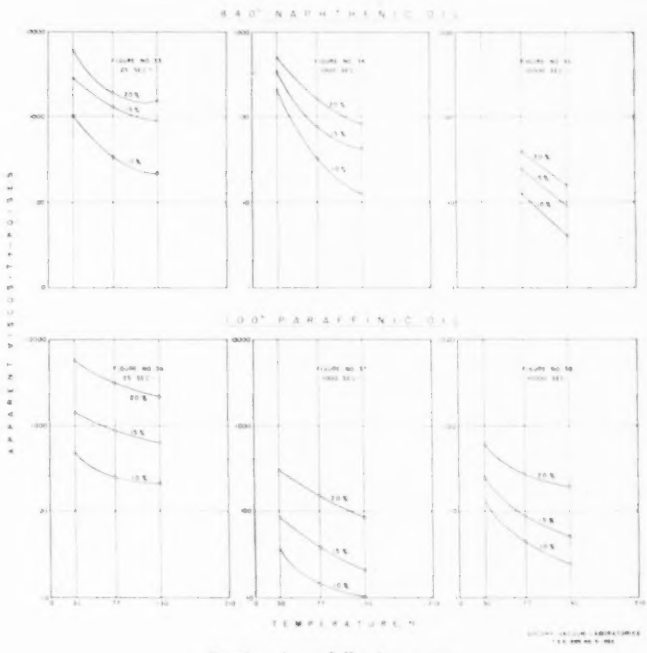




APPARENT VISCOSITY VS. TEMPERATURE OF ALUMINUM GREASES



APPARENT VISCOSITY VS TEMPERATURE OF CALCIUM GREASES



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We congratulate the Institute on the growth and progress made by "The Institute Spokesman" in the past ten years.

Our best wishes are extended for the continued growth and success of the "Spokesman".

Fiske Brothers REFINING CO.

NEWARK, N. J. TOLEDO, OHIO

The Effect of Soap Structures On Apparent Viscosities of Lubricating Greases

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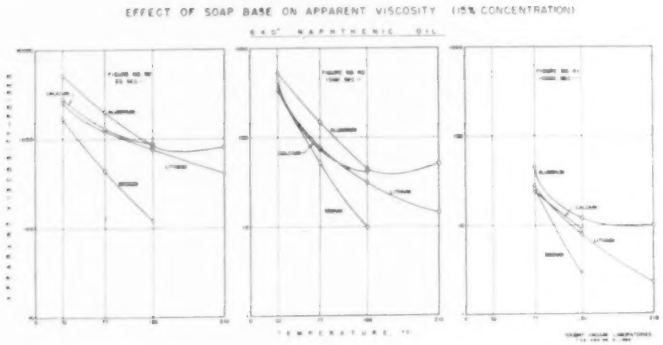
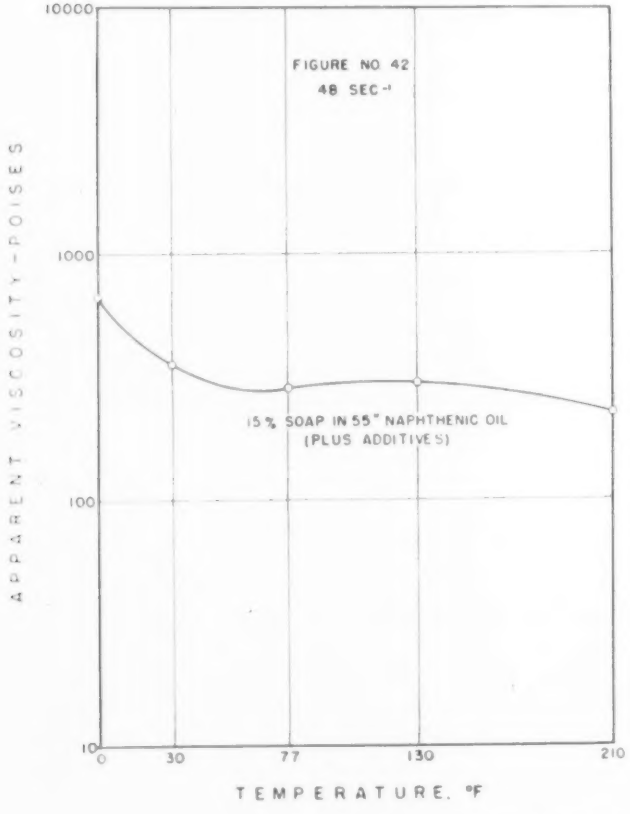


APPARENT VISCOSITY VS TEMPERATURE OF LITHIUM GREASE



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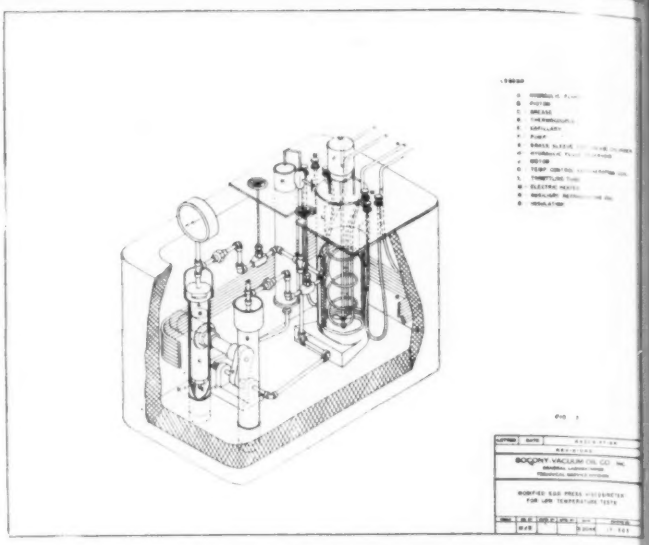
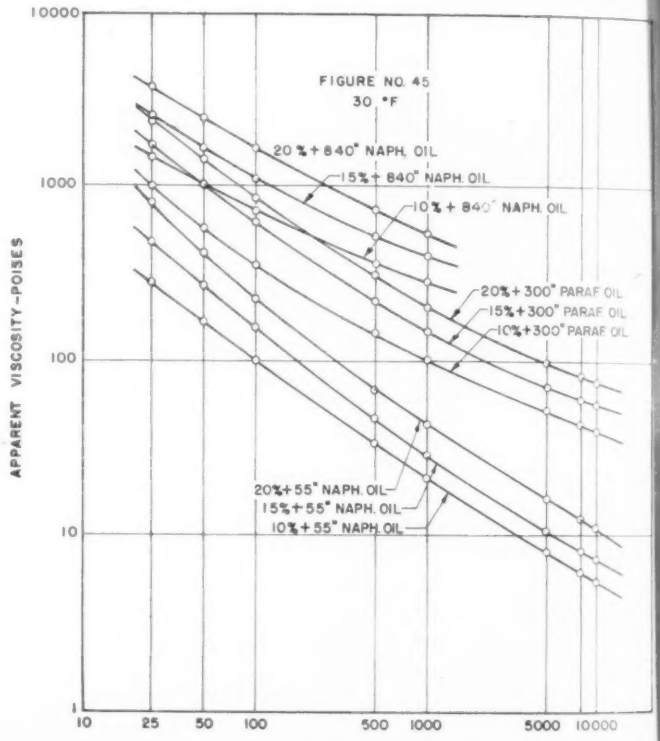


LITHIUM GREASES IN NAPHTHENIC AND PARAFFINIC BASE OILS



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Index to Volume Ten of "The Institute Spokesman"

Page 18 of this issue of "The Institute Spokesman" carries a complete index of Volume X of "The Institute Spokesman," starting with the April 1946 issue to and including this issue of March 1947.

The index is alphabetized by the author's name and gives, in addition to the title of the paper, the month, year, volume, and number of its appearance. This index in combination with the one that was printed in the January 1947 issue of "The Spokesman," makes a complete index for the 10 years of the publication.

In the March issue of succeeding years we will print a similar index of the complete volume and at three- or five-year intervals we will publish a complete index of all of the papers that have appeared in "The Spokesman" from the time that the publication was started.

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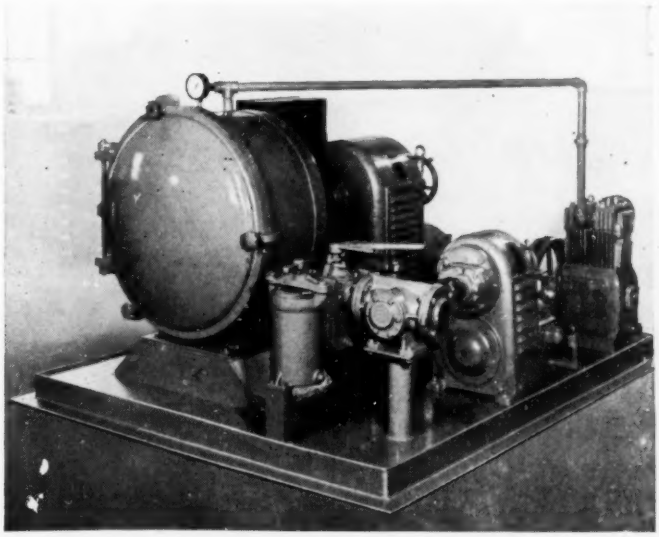

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DESIGN OF ANTI-FRICTION BEARING INSTALLATIONS WITH SPECIAL REFERENCE TO ELECTRIC MOTORS

By W. T. Saveland, Allis-Chalmers Manufacturing Company

About the Author

The author was born in Milwaukee in the year 1914 and received his undergraduate schooling in that locality. He attended Marquette University Engineering School during the years of 1936 through 1941, graduating with a degree of B.S. in E.E. As Marquette follows the cooperative system, part of this time was spent as an apprentice in the shops of the Allis-Chalmers Manufacturing Company, located in Milwaukee.

The author is a member of Triangle Fraternity, Tau Beta Pi and Pi Mu Epsilon.

Some time after graduation was spent in the completion of the Allis-Chalmers Graduate Training Program.

Since 1938, the writer has been located in the Electrical Department of the above company as Assistant to the Mechanical Engineer and Assistant Mechanical Engineer at Milwaukee, specializing in mechanical design of various types of rotating electrical equipments. In 1944, he was appointed Mechanical Engineer at Norwood Works, 4620 Forest Avenue, Norwood 12, Ohio.

Walter T. Saveland, Jr., Mechanical Engineer of the Allis-Chalmers Manufacturing Company Norwood Works, delivering this paper before the 14th Annual N. L. G. I. Convention in Chicago, September 30th, 1946.

EDITOR'S NOTE:
The opinions expressed in the following article are those of the author. "The Spokesman" takes no credit and assumes no liability therefor.

Since anti-friction bearings are familiar to a great many fields in industry and there is evidence that their usefulness is on the incline, the proper lubrication of such bearings grows increasingly important. This involves use of the correct lubricants and, for the manufacturer, assemblies designed for proper lubricant retention or replenishment.

For proper lubrication, it is necessary to provide a lubricant that will effectively coat all surfaces at all times to prevent contact with unfavorable atmospheric agencies, and one that will aid in keeping solid, liquid, or gaseous foreign matter from contact with the bearings. This lubricant must also provide a film to minimize the friction developed at sliding contacts, as between the balls and the retainers of the ball bearing, in addition to helping dissipate the heat generated.

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Greases and oils are practically universally used as lubricants for anti-friction bearings of electric motors, greases being selected in the great majority of the installations. Grease, of course, frequently has very apparent advantages. The design of the machine is greatly simplified over that of one equipped with an oil lubrication system. The grease may be employed as a supplementary sealing agent. The lubricant is more readily retained within the proper spaces. However, the use of grease does not imply that maximum amount of care need not be used in the design of such units.

There are several purposes that should underlie such designs. Caution against the possibility of over-greasing is imperative for all installations of any size and speed of operation. Over-filling of the grease reservoir invariably results in some form of damage to such an installation, if the speed of operation is at all high. This damage is caused by excessive churning of the grease, creating extreme heat that shortens the life of the lubricant. This overheating results in too rapid separation of the oil from the grease, and greatly hastens the oxidation and breaking down of the grease components. Indications are that the rate of deterioration due to heat doubles with each 15° and 18° F. rise in temperature.[1] [2] This type of overheating is known to become so severe as to result in the destruction of the bearing. We know of instances where complete motors have been thoroughly wrecked as a direct consequence of complete anti-friction bearing failure.

Although under-greasing is not so general a problem, its possibility should not be forgotten, as instances do occur where operators fail to add grease in sufficient amounts, or at frequent enough intervals to maintain a film of lubricant to protect the bearings. The only way the motor manufacturer can aid the customer in this respect is to make the procedure for adding grease reasonably easy and foolproof so that the operator will not be too reticent to grease the machine in the proper manner.

A great many installations are, or should be, so designed that flushing of the old lubricant from the bearing vicinity can be accomplished. Used up grease should not be permitted to remain within raceways, as some of the residual components will eventually cause damage to the bearing. Other undesirable substances such as dirt, moisture, acids, and alkalies can also be kept from getting in close contact with the bearing by means of adequate purging. The prime objective is to remove used up grease and other materials from the vicinity of the bearing itself, and to replace it with new, fresh grease. Where the assembly is properly designed, grease flushing will accomplish this. Fluid flushing will remove such materials from the entire grease cavity; however, extreme care and good judgment should always be used or more damage than good can result from fluid flushing. Double shielded

Continued on following page

[1] *Life of Lubricant Cut in Half for Each 15° F. Rise*
"A Program for Industrial Lubrication"
V. M. Palmer and C. L. Pope, Mechanical Engineering, Vol. 62, No. 12, Dec., 1940.

[2] *Oxidation Absorption Rate Doubles for Each 10° C. Rise*
Comment on above by MacLean Houston, Mechanical Engineering, Vol. 63, No. 29, Sept., 1941

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bearings, of course, cannot be internally flushed in the usual manner unless of a type employing removable shields.

Adequate design will pay dividends to the manufacturer in the form of increased good will. The owner and operator of the equipment will benefit in several ways: many unnecessary breakdowns will be prevented, time intervals between scheduled shutdowns for partial or complete overhaul will be greatly lengthened, and the straightforward lubrication procedure will encourage the operator to give proper maintenance to the equipment.

Requirements that May Influence or Determine the Design

It is probably generally agreed among most operators of machinery that electric motors are subjected to about as wide an overall range of operating conditions as any other type of equipment. These conditions are sometimes known and in the case of special machines, may be designed for. If certain bad operating conditions are known to be absent, we can eliminate some features and concentrate on those other factors that are known to exist. However, motors that are not sold for specific applications, and they comprise the great majority of sales, can be subjected to any conceivable combination of operational abuses. The motor manufacturer can frequently only try to combat what would probably be the worst reasonable conditions of operation.

The selection of the bearing and the design of the bearing chamber are largely dependent on the service that may be required of the particular machine. We refer to such considerations as intermittent or continuous duty, ambient temperature and permissible temperature rise, these factors being determined by the rating of the motor. Another factor is whether the machine is suitable for belted drive or is for direct connection only. Considerable external thrust may also be specified. The type and degree of motor enclosure is important and may be of considerable influence. Some of the enclosure requirements as contrasted to an open machine are splash-proof, totally enclosed, and explosion-proof. The position of mounting is obviously important. Vertical or inclined motors must frequently be treated differently than horizontal motors. Adequate sealing must always be included to protect windings that are vulnerable to oils and greases, and to avoid loss of lubricant that may be objectionable outside of the motor.

An important consideration that frequently restricts the design is space availability. The electric motor industry has standardized on basic frame size standards that establish outside dimensions of motors for a wide range of ratings. Space requirements of the electrical components of a motor are largely set by the motor rating and permissible temperature. These requirements are further set by other electrical factors, as alternating or direct current, the frequency (if altenating current), and the voltage. The remaining volume is available for structural parts, ventilation and bearing requirements.

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Provision for externally mounted items, as sheaves or brakes, frequently limits the location and type of greasing or grease removal details.

We can always expect the reliability required of the particular unit to be high because of the fact that the motor is the prime mover. With standard general purpose motors, the motor manufacturer can never determine what the application will be and, as a result, must make every reasonable effort to insure that service obtained will be reliable and, preferably, of such a type that a notice of impending failure will be given to the operator sufficiently far in advance to enable him to take some precautions before failure is complete. This, of course, will also hold true in the case of special designs wherein the motor manufacturer has more information available at the time of purchase and during construction.

The probable extent of operation and overall life of the unit can sometimes be foretold for special applications and this, then, can be used as one criterion in design. When operating conditions are definitely indicated, the design, of course, will be based on such known conditions. We are again referring to agents such as dust or acids, and other factors, as excessive heat or cold, water, and the location and mounting. The customer's specifications, or those set up by the customer's agent, frequently specifically influence the motor manufacturer's final product.

The electric motor industry is highly competitive, and the cost of the bearing component parts, with respect to that of the entire unit, must always be taken into consideration. Effort must be made to produce a unit that will be most satisfactory; however, if conditions are extremely unusual, or the quantities involved are too small to justify considerable expense such as will be involved in drawings and patterns, a compromise can sometimes be made.

Some Designs Employed By Various Motor Manufacturers

There have been many varied detailed designs developed to provide lubricant for ball and roller bearings. Some of these more simple designs are, or have been, used by most manufacturers for some of their products.

Although not to be considered an integral component of the machine, instruction plates mounted on the motors, giving greasing procedure, are of great effectiveness in initiating the desirable lubrication program and are most likely to be followed by the operator. Instruction sheets, or cards, are frequently shipped with machines and, in many instances, prove satisfactory; however, we all know that sometimes such literature is not available to the operator, or is eventually lost. Information should be included as to the type and quality of lubricant required, the quantity of grease to be added, and the frequency of application, in addition to the method to be followed. The carrying out of these instructions must be tempered in accordance with conditions existing at the particular installation.

Continued on following page

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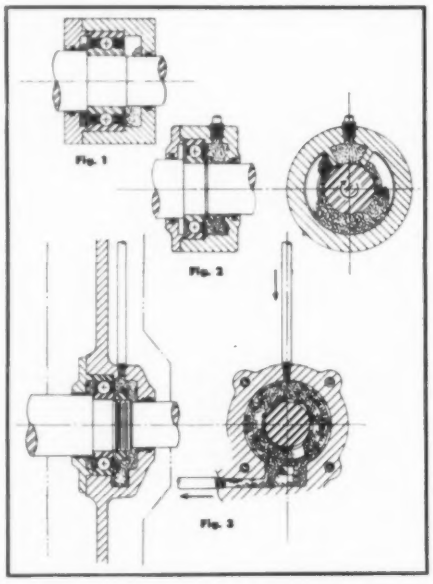
Occasionally some other additional instructional procedure, such as a widespread advertising program, is used by a manufacturer to encourage proper lubrication, or even to build up confidence in an unusual or different product design.

One of the simplest of basic design practices sometimes followed to avoid a tendency to add excess grease is to omit all external greasing openings, thereby requiring that the machine be partially dismantled whenever lubricant is to be added. Bearing assemblies with no provision for greasing except by partial dismantling of the unit, are often practical and desirable for use with electric motors. However, the size of the bearing and its operating speed, together with the service the motor is subject to, will determine the tim element between bearing checkups. If the operating time between servicings is but a few months, or the motor is of such size that considerable time and labor is required for dismantling, provision should be made for regreasing without disassembly.

The conventional open bearing mounted within a partially grease filled chamber is often used in motors without fittings. The single shielded bearing is also applicable and has the ability to more effectively seal the unit against the entrance



of dirt from one direction. The type of construction involving double removable shields provides for assembly as a prelubricated bearing (Figure 1). This is most effective in the wide type so-called cartridge bearing in that both grease content and sealing effectiveness is at a maximum. Some of these cartridge bearings have been equipped to provide for lubricant addition without dismantling, but the service life has been found to be such that this provision is not necessary.

Standard width double shielded bearings will have a rather short period of unattended operation as compared to double width bearings of far greater lubricant content. Either of these may operate longer between servicings if provision is made to pack some grease around the shields. This external grease can provide some makeup oil if the shield has but a simple running clearance, rather than a labyrinth or rubbing seal and also act as a supplementary seal between period of dismantling. Re-lubrication is then ef-

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cted by demounting of the removable ields, or in some instances may be ac-mplished by injection of the required italizing components thru self-closing nings provided by the bearing manu-cturer. Lubricant used with self-sealed rings must always be of a highly stable ge because the total quantity of grease ilable for use is limited and the bear-g will be expected to serve for a period years before inspection, in addition to indeterminate length of storage.

Another practice followed is the omis-n of all convenient fittings such as ssure fittings or grease cups, and the ovision of openings normally closed as by pipe plugs. This means that anyone who wishes to service such a machine must obtain grease fittings that are suitable for insertion before he can proceed. Designated maintenance personnel will, of course, be equipped with whatever fittings are required for the various machines.

Grease fittings are required on motors if the size and speed, or other conditions of service, are such that regreasing will be necessary at intervals too frequent to permit dismantling. It should be recalled that taking down a motor to inspect bearings often must be preceded by disengagement from the driven machine and pulling off a half-coupling or sheave. Presence of a second shaft extension on which may be mounted a brake, exciter, external fan, or where it is utilized as another driving shaft, would further complicate this operation. Further, motors are often located in areas where it is unsuitable to expose an anti-friction bearing. To open up a motor operated in such a location, it would be advisable, or necessary, either to remove the motor or control the detrimental agencies that may be present, such as corrosive vapors or dusts.

Bearings of machines equipped for regreasing can be protected from excess grease by using either one or two integral shields, or by providing a separate baffle between the grease receiving compartment and the bearing cavity proper. Another factor that tends to aid shields or baffles is a sectionalization of the bearing cavity in such a manner as to prevent newly added grease from spreading throughout the entire bearing cavity during any one application (Figure 2). Normal operation of the machine will then carry some of the fresh grease from the receiving chamber to the rest of the compartment before additional grease can be forced in. You will notice that, with such construction, new grease passes immediately adjacent to the shield while en route from the primary chamber to the other cavity, and will displace a considerable amount of the older grease from the bearing vicinity. If the primary chamber is located at the upper portion of the bearing, the progressive motion of the grease will be somewhat amplified, thus improving this flushing action. A portion of the oil content of the newly added grease thereby will be enabled to pass through the running clearance to revitalize the lubricant within the bearing. This grease addition would usually be made on one side of the bearing only, but, on occasion, can be provided

Continued on page 23

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Index to . .

TECHNICAL ARTICLES APPEARING IN

"THE INSTITUTE SPOKESMAN"

Vol. X—From April, 1946 to March, 1947

Greetings to . . .

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on this Tenth Anniversary

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PRESIDENT'S COLUMN

Continued from Page 3

by the Active Members. The Board elects annually, in the Fall of each year, a President, a Vice-President and a Treasurer from its membership.

In addition, the Institute now has an Executive Secretary who devotes his full time to the work of the Institute. The headquarters office is in Kansas City, Mo., which is a reasonably central location for the membership which comes from practically all geographic sections of the country.

The Board of Directors* meets about four times per year, and a smaller Executive Committee, representing the Board, meets more frequently as conditions require.

The Institute holds an Annual Convention in the Fall at which various interesting and informative papers are presented, both by Institute members and by others prominent in industry invited to present papers on related subjects of more than usual interest at the time. The Institute has always encouraged open value to those attending these open discussion of these papers and considerable information has been presented of value to those attending these open meetings. These annual N.L.G.I. Conventions have gained public interest from year to year as indicated by the increasing attendance from various industries.

A new and enlarged Constitution and By-Laws is being presented to the membership for approval. It is hoped that this will facilitate expansion of the Institute's activities and its usefulness to both manufacturers and consumers of grease.

The purpose of the Institute is to act as a clearing house for the collection and dissemination of lawful information pertinent to the manufacture and use of lubricating grease and to promote:

The development of product classification and methods of test through research, practical tests and through cooperation with other technical

*The names of the present Directors and Officers are shown elsewhere in this issue.

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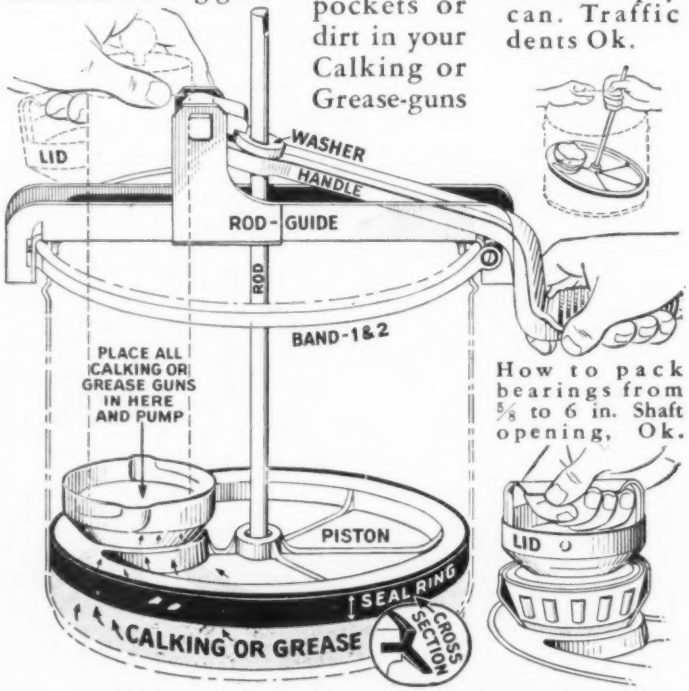

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societies; and the publication of such data for the use of consumers of grease and the grease manufacturing industry.

The study and development through research and technical procedure of improvements in the manufacture of lubricating grease, new uses, and the study of new consumer requirements.

The collection and dissemination of technical information, including improved manufacturing equipment, new uses and improved methods of application of lubricating greases, to members, consumers and industry in general.

The fostering of such industry policies as will tend to maintain free and open competition among manufacturers and all classes of trade who serve in distributing the products of the industry.

The Institute has plans for increasing its value to its membership and to industry at large along technical lines. This effort will be spearheaded by the Institute's Technical Committee.

At the Annual Convention last Fall, the Technical Committee sponsored a symposium on "Pumpability of Greases and Delivery Characteristics of Dispensing Equipment," which was participated in by manufacturers of grease equipment as well as by grease manufacturers. This symposium was so well attended that it is planned to include a symposium on a timely subject of interest as a part of the Technical Committee's program at each Annual Convention.

Some few years ago the Technical Committee developed the "NLGI Grease Consistency Numbers" which have been broadly adopted by industry as a convenient means of indicating the consistency of a grease desired for a specific application within the range of the consistency numbers which cover most greases now being manufactured.

National Lubricating Grease Institute is cooperating closely with the Lubrication Committe of the American Petroleum Institute on technical problems relating to grease, maintains a membership in the American Society for Testing Materials for close cooperation relative to specifications and methods of test, and is making plans for increasing cooperation with other technical societies interested in lubricating grease, its manufacture, specifications, test methods, application or use.

Future plans contemplate the publication of an increased number of technical papers of interest and value to users of grease. Also, the dissemination of data relative to improved methods of manufacture and the study of new uses and improved methods of application.

The Institute plans to work with grease manufacturers and with makers of grease dispensing equipment towards assisting them in setting minimum performance characteristics for pumpability and in other ways to be helpful in securing better service to consumers of grease.

The Institute hopes to acquaint industry in general with its facilities for the discussion of any lubricating problem relating to grease, and hopes each year to increase its usefulness to the users of grease as well as to the manufacturers and marketers.

In addition to its Annual Convention each year in Chicago or New York, the Institute hopes to hold a semi-annual

Continued on page 23

Greetings FROM THE FOUNDERS OF THE N. L. G. I.

"The Institute Spokesman" becomes ten years old with this March issue. The editors —past and present—are to be commended for the very worthwhile publication which has added so much of interest to the affairs of the National Lubricating Grease Institute.

When George W. Miller issued the first "Spokesman" in March 1937 he laid the foundation for a publication which would give the members pertinent news and also items of lasting interest from a trade and scientific standpoint. Mr. Miller ably guided the affairs of the Institute and his duties as Executive Secretary took considerable of his time, even without considering the hours he gave to editing the "Spokesman." The current index of articles published over the past ten years is ample evidence of the high calibre of the material published in our magazine.

Also, we owe gratitude and appreciation to the companies who have advertised regularly in the "Spokesman" over the past ten years. They have contributed moral and financial support which has aided in making the publication a success.

"The Institute Spokesman" is highly regarded among technical groups. It has been a source of information not only for the membership of the N. L. G. I., but technical libraries in this and other countries secure copies for their records.

The new and larger "Spokesman" represents another period of growth in the forward advance of the National Lubricating Grease Institute. Our organization has grown to such stature now that we can have a full-time Executive Secretary. Mr. Carl E. Bolte assumed the responsibilities of editing "The Institute Spokesman" along with his other duties on July 1, 1946. The membership of N. L. G. I. can look forward confidently to increased prestige and benefits to the organization through his efforts.

May the coming decades deal kindly with the men and companies who rely upon N. L. G. I. to provide helpful associations and assistance—and may "The Institute Spokesman" grow apace with the needs of the times.

—Mr. J. R. Battenfeld, President, Battenfeld Grease and Oil Company, Kansas City, Mo., Founder and First President.

Congratulations to the husky ten year old! "The Institute Spokesman" was begun ten years ago as a two page mimeographed sheet, and its editors cannot be praised too highly for what they have accomplished with limited funds and time in the short space of ten years.

To our friend, George W. Miller, who for many years faithfully served N. L. G. I. as Executive Secretary without compensation, should go the major credit for the growth of "The Institute Spokesman." We who know George realize that he gave up many hours of his limited time to editing "The Institute Spokesman." Credit for the "Spokesman" in its present form goes to our able, full-time Executive Secretary, Mr. Carl E. Bolte, who assumed his duties with N. L. G. I. in July 1946.

The "Spokesman" is recognized as the official publication of the grease industry, and as such is highly regarded throughout the world for its technical articles on manufacture, testing methods, and application. We can confidently look forward to the continued growth and usefulness of this publication under the guidance of our Executive Secretary. We gratefully express our appreciation to our advertisers whose financial support has contributed, and will continue to contribute, to the growth of the "Spokesman."

As the years go on, may the usefulness of "The Institute Spokesman" increase, not only to N. L. G. I. members and associates, but also even unto the "man on the street."

—W. H. Saunders, Jr., President, International Lubricant Corporation, New Orleans, La., Founder.

"The First Ten, With Four Score Yet to Go"

Continued from Page 2

previous twelve issues, and from time to time we will publish in the March issue a complete index of all previous issues.

Today on its tenth anniversary "The Institute Spokesman" stands in an enviable position. It has a world-wide circulation. It has grown in size. The number of advertisers has increased. Among its contributors are the outstanding scientists and technologists in the industry. Files of "The Spokesman" are religiously kept by company libraries, by individuals, by technical institutions, by colleges as text book and reference material. For all of this we are duly grateful and give proper recognition and pay just tribute to all of the people who have contributed to its success; the authors of technical papers, the advertisers, the stalwart group of men who through the early formative years of the National Lubricating Grease Institute never faltered or wavered for one moment in their faith and conviction that "The Spokesman" would render a great service to both the producers and the consuming public of lubricating greases.

Special credit is due Mr. Geo. W. Miller of Battenfeld Grease and Oil Company, Buffalo, New York, who served so capably and faithfully as the editor and business manager of "The Institute Spokesman" for all except the last five months of this entire ten-year period. Mr. Miller's faithful and untiring efforts are largely responsible for "The Institute Spokesman's" great progress and enviable position of today. Those millions who have enjoyed and profited by "The Institute Spokesman" in the past and will continue to do so in the future join in this expression of grateful thanks to all of those who have made "The Spokesman" such an outstanding success.

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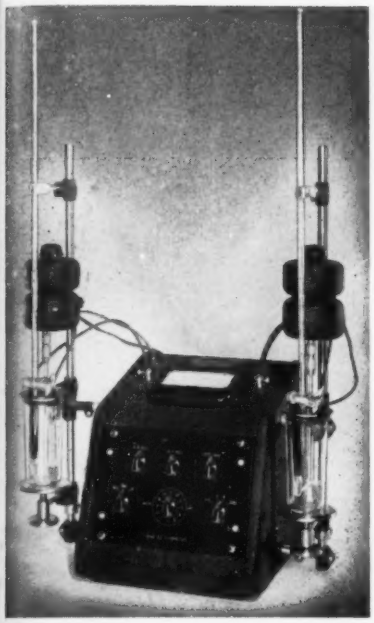

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President's Column

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meeting to be held in various of the larger cities from year to year, and in that way to better acquaint the larger industrial centers of the country with the activities of the Institute.

It is planned to have copies of each paper presented at the Annual Conventions available for distribution on the day the paper is presented and to follow a similar plan at the semi-annual meetings. Selected papers will also be reprinted in "The Institute Spokesman" for the benefit of those unable to attend the meetings.

Through the pages of "The Institute Spokesman" with its improved format and its rapidly growing circulation, the Institute hopes to bring technical information, useful data and interesting news of the industry to the increasing number of its readers, and through "The Grease Spot" to give Institute members additional news of current events pertinent to their industry.

This is a fitting time to acknowledge the efforts of all those who have helped in the formulation of our plans for future progress and to pay tribute to all those who have given their support in the past and who have thereby helped to bring National Lubricating Grease Institute to its present position in the grease industry.

We extend a cordial invitation to other grease manufacturers, to grease equipment builders, to those in allied industries, and to technical people in general, to join with us in making National Lubricating Grease Institute of increasing interest and value to all who have problems relating to the application and use of lubricating greases.

—H. P. Hobart, Pres. N.L.G.I.

Design of Anti-Friction Bearing Installations

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for on both sides of the bearing. Once this type of unit is completely filled, its inability to absorb a further reasonably sized charge of grease is sufficient notice that the motor should be taken down for removal of the accumulated grease and necessary cleaning.

Continued in next issue

CONGRATULATIONS TO "THE INSTITUTE SPOKESMAN" on this TENTH ANNIVERSARY!

★

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